INSTRUCTION MANUAL

ES-30-RM

NJE CORPORATION

345 CARNEGIE AVENUE, KENILWORTH, N. J.

INSTRUCTION MANUAL

MODEL

ES-30-RM

DC POWER SUPPLY

NJE CORPORATION
345 CARNEIGE AVENUE
KENILWORTH, N. J.
CHESTNUT 1-1500

SECTION I

SPECIFICATIONS

MODEL ES-30-RM

Input: 115 volts, 60 cycles per second, one phase, at approximately 4 amperes, 85 % power factor, at full load.

Output: Continuously variable by front panel control from 0 to 40 volts DC at O to 4 amperes.

Ripple: 1% RMS maximum.

Regulation: Line, ±0.5% for line voltage variations of ±10%. (Line regulated units only).

Load, 10 % (of maximum output voltage rating) no load to full load.

SECTION 2

THEORY OF OPERATION

The information in this section applies in general to all conventional metallic rectifier power supplies. Specific circuit details pertaining to this power supply should be obtained, after reading this theoretical treatment, from the circuit diagram at the rear of the manual.

The elements of a metallic rectifier power supply are as follows: (Refer to figure 1).

1. A variable autotransformer, whose output voltage is adjustable from zero to approximately 120% of the input voltage value. In three-phase units a separate autotransformer is used for each phase, and the three rotors are ganged to one control shaft.

2. A transformer-rectifier circuit that steps the input voltage up or down as required to provide the rated range of output voltage, and converts the AC current to pulsating direct current. The rectifier circuit used will depend upon the current range of the unit. It will be a full-wave centertapped configuration in light-current supplies, and a full-wave bridge, three-phase half wave, or six-phase star configuration in heavy-current units.

3. A low-pass, single-section, choke-input filter, designed to suppress the ripple component in the pulsating DC voltage.

4. A heavy-duty bleeder resistor. This bleeder "pre-loads" the metallic rectifier, so that a minimum current is drawn even when the external load is disconnected. At very light loads the rectifier exhibits a greater variation in its internal voltage drop, for a given change in load current, than it does at heavier loads. The bleeder, by imposing an initial load, thus causes the rectifier to be operated in a load region which results in less load regulation by the rectifier. (In cases where the external load is permanently connected to the supply, this bleeder resistor can be disconnected, thereby making an additional amount of current available for use in the load, with no sacrifice in regulation.) In addition to acting as an initial load, the bleeder resistor also assures rapid discharge of the filter capacitors, removing the shock hazard for personnel inspecting or maintaining the equipment after shutdown.

In this "brute-force" type of DC power supply, tight load regulation is achieved through the use of low-resistance transformers and chokes, and heavily-derated rectifiers.

The total series resistance is low, and the resultant voltage drop due to the passage of the load current is correspondingly small. The change in load voltage, as the load current is varied from zero to maximum, is consequently a relatively small one. There is no compensation for line voltage changes, however, and a line variation of a given percentage will result in a DC output voltage change of the same percentage. This effect is unimportant in many applications, where line variations would have an adverse effect, the "ELS" or "ELG" models are employed. These units are provided with one or more line voltage regulating transformers ahead of the variable autotransformer. The output of the regulating transformer varies less than 0.5% for an input variation of 10%, and thus provides a very steady AC source for the power supply circuit.

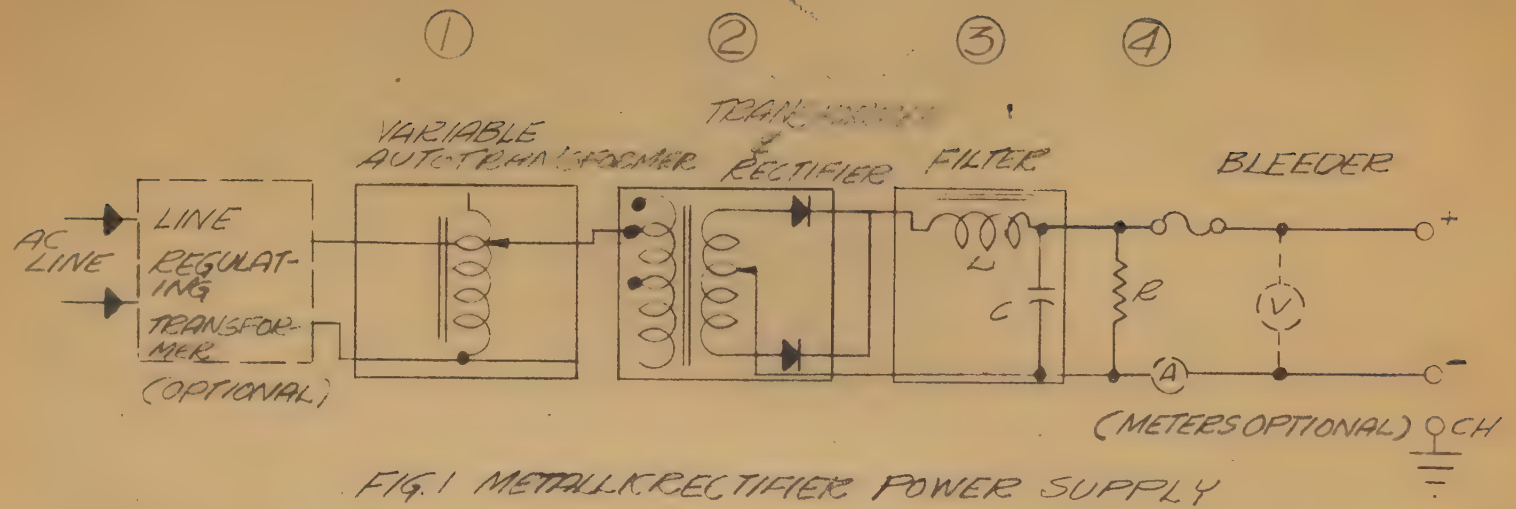


FIG. 1 METALLK RECTIFIER POWER SUPPLY

1. Unplug instrument from power line. Check line plug and cord for loose connections or worn insulation.

2. Remove cabinet, remove bottom plate, and inspect the interior for dust deposits which should be blown or brushed away; and reduce voltage (Volts, ohms or small components, which may have failed through the resulting excess during bench use. Look for signs of overheating, which may indicate overloading due to misuse or malfunctioning of the circuit.

3. Check that chassis-mounted components are securely held in place by their clamps or brackets. Wipe them with a soft cloth to remove heavy dust deposits.

4. Check knobs, binding posts, terminal strips, and fuse extension clamps for looseness. Tighten carefully, preserving alignment.

5. Check calibration and zeroing of meters, if any.

6. Check that fuse holders contain the correct fuses. Do not overfuse!

7. Replace cabinet covers and/or bottom plate, and check operation of instrument as follows:

8. Rough regulation check. Operate supply from a 115 volt line. Set supply to approximately mid-range. Monitor output with external meters, unless it has panel meters. A long-scale external voltmeter is recommended, under circumstances, for a meaningful check. The scales should read at least mid-scale at mid-range of the supply, so that changes of the order of the nameplate regulation are discernible. Alternately connect and disconnect an external load (of appropriate rating and resistance) to draw full rated current at the output level selected) observing the voltmeter for steady-state changes. If the output varies more than the product of nameplate regulation and output voltage, a detailed check of the unit should be made.

The "recovery-time" of all conventional power supplies is such that they will momentarily deflect several times their stated regulation when full load is suddenly applied. Read the steady-state value as the output. (Removing the load does not, in general, cause such transients.

the output ripple by means of a low-range AC voltmeter
led to the DC output by means of a 0.1 microfarad capacitor.
sive, check the capacitor bank for blown fuses or "open"
ors. Examination of the waveform by oscilloscope at the
minal of the filter choke should show smooth half-sine-
terns for each rectified phase. A notch in the wave-form
a defective choke, while absence of any phase indicates
ve rectifier.

REPAIR PROCEDURE

WARNING!!!

ALL NJE POWER SUPPLIES PRODUCE VOLTAGES DANGEROUS TO LIFE! EXERCISE EXTREME CARE IN PERFORMING VOLTAGE MEASUREMENTS!

neral, component failures in NJE Regulated Power Supplies will be limited and load fuses by the conservative circuit design employed in their facture. The following general hints should be of assistance in locating

O OUTPUT VOLTAGE-- LOW OUTPUT VOLTAGE

Check fuses. Visual check is not enough - use low-range ohmmeter.

Check power line by plugging in another instrument, or by use of a voltmeter.

Check output of transformers, rectifiers and filter circuits. If there is no output from a given stage, or if it is significantly low, first checking for short circuits in

LURE TO REGULATE PROPERLY

Excessive Load: Check that load current is within rating of supply.

b. Outside Range: Check that load voltage to which supply is set lies within its rating. Often a supply can be adjusted to operate beyond the range for which it was designed, but it will not regulate properly over the entire current range under these conditions.

Line Voltage: Check the power line voltage at the socket (preably with the supply plugged in and operating) with an accurate c. voltmeter. Remember that the ordinary "multimeter" or rectifier-type voltmeter rarely has an original accuracy of better than 3% of full scale, which may imply as much as 10-12 volts of ies work effectively down to 105 volts RMS, but below that value

d High Line Voltage Excessively high line voltage can cause component failure in a power supply, as in any other electronic device. Avoid using your power supply in locations having more than 125 volts RMS at any time.

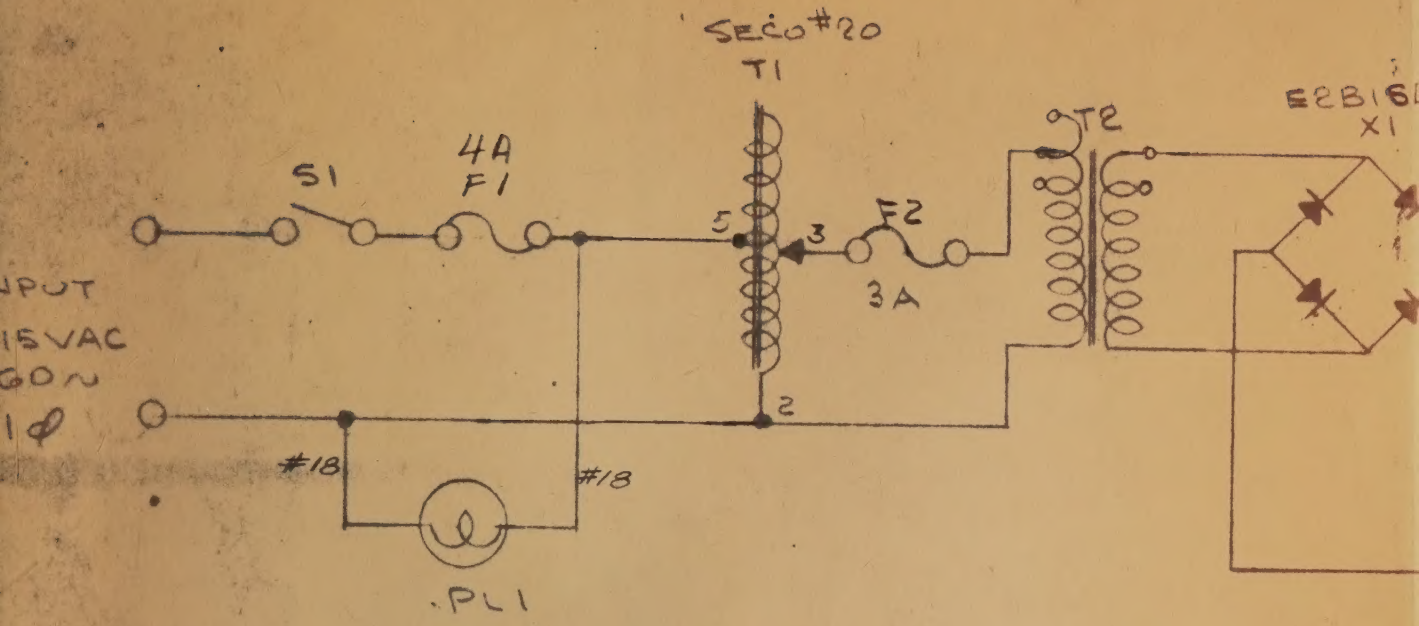
--Continued.

) RIPPLE

chassis. A "floating" supply has much more inherent hum and than one in which the chassis "ground" is at the same potential positive or negative output terminal. Check the load for vity" by replacing it with a fixed resistor of appropriate value, nected by reasonably short leads. Check that the measurement ripple is valid. Ripple is best measured on a calibrated oscilloscope

k all points discussed under "Failure To Regulate", above.

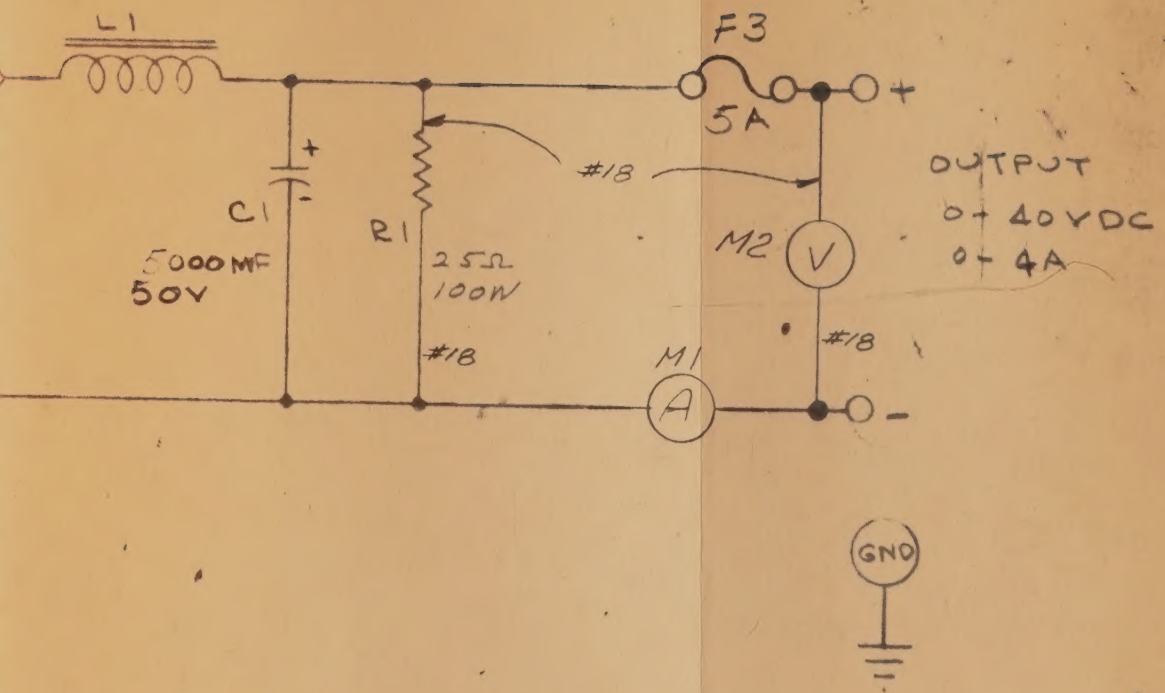
hum out of filter against amplitude and waveform indicated on dc drawing. If it is excessive, check the rectifiers for un- the choke for shorts, and the filter capacitors for opens.



NOTES:

1. #14 WIRE THROUGHOUT
2. METERS USED ON -CM & -RM MODELS ONLY.

GX



MATERIAL	N. J. ELECTRONICS CORP.
FINISH	345 CARNEGIE A... KENILWORTH, N. J.
ALL DIMENSIONS IN INCHES DECIMALS ± .005 FRACTIONS ± 1/64 ANGLES ± 1/2 UNLESS OTHERWISE SPECIFIED	SCHEMATIC
DESIGNED	APPROVED amse
DRAWN BY #6	CHECKED
DATE 6-20-56	SCALE ~
DWG. NO. S-ES-30-1	SIZE C
SHEET 1 OF 1 SHEETS	3

OUR WARRANTY: N J E Corp. warrants each power supply manufactured by them to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and to replacing any defective parts thereof, except tubes and fuses in "standard-grade" models. This warranty is effective for one year after delivery to the original purchaser when the instrument is returned, transportation charges prepaid by the original purchaser, and which upon our examination is disclosed to our satisfaction to be defective. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at cost. In this case, an estimate will be submitted before the work is started.